DOE 92-234

RADIOLOGICAL MONITORING IN THE PALOMARES ZONE
PERIOD: FIRST HALF OF 1991

Translated for

U.S. Department of Energy
Washington, D.C.

Translated by

SCITRAN COMPANY
1482 East Valley Road
Santa Barbara, California 93108
(805)969-2413
FAX (805)969-3439

92-234

RADIOLOGICAL MONITORING IN THE PALOMARES ZONE
PERIOD: First Half of 1991

Translation of an August 1991 Spanish paper entitled "Vigilancia Radiológica en la Zona de Palomares - Período: Primero semestre del año 1991", published by the Energy, Environmental and Technological Research Center of the Environmental Institute [Spain].

Translated by

S C I T R A N

1482 East Valley Road

Santa Barbara, CA 93108

ENERGY, ENVIRONMENTAL AND

TECHNOLOGICAL RESEARCH CENTER

CIEMAT/IMA/UGIA/M5A01/03/91

[logo] CIEMAT - ENVIRONMENTAL INSTITUTE

RADIOLOGICAL MONITORING IN THE PALOMARES ZONE

PERIOD: First Half of 1991

August 1991

TABLE OF CONTENTS

RADIOLOGICAL MONITORING IN THE PALOMARES ZONE

PERIOD: First Half of 1991

Radiological monitoring was carried out in the Palomares zone during the first half of 1991, in accordance with the planning established in the report "RADIOLOGICAL MONITORING IN THE PALOMARES ZONE: PROGRAM FOR 1991". The following operations were conducted:

1. MONITORING OF PERSONS

The operations corresponding to this section were:

a) Planning of the two survey campaigns for 1991 and partial execution of the first.

b) Obtaining of pending results corresponding to the 1990 survey campaign.

The following subparagraphs reflect the contents of each of the cited activities.

1.1 SURVEYS 1991: PLANNING AND OPERATIONS

Planning of surveys to be conducted in 1991 is subject to the criteria and priorities set forth in the report: "RADIOLOGICAL MONITORING IN THE PALOMARES ZONE: PROGRAM FOR 1991", submitted to the CSN in May, 1991. In accordance with the cited document, a list of 236 persons has been drawn up, for purposes of making studies on 150 in two campaigns during the year, the first from June to September and the second from September to December. For logistical reasons, it is not a precondition that the total of the 150 persons planned belong to the mentioned list of 236 persons. Some of the persons studied will be companions.

By way of a summary, we can indicate that the following groups and number of persons have been included in the list:

1-A. Persons who have, at some time shown positive results of contamination in the urine. Comprises 24 persons.

1-B. Persons from Villaricos who are being examined because they were involved in decontamination tasks at the time of the accident. Comprises 14 persons.

1-C. Persons who have reached the age of 12 and have not been

examined. Comprises 14 persons.

2-A. Persons who showed a positive result on one occasion, and who have since given negative results. Also persons who have been summoned for examination and for some reason, did not appear. Comprised of 12 persons.

2-C. Persons under the age of 20 with only one examination, which was negative. Comprises 30 persons.

3-C. Persons who have reached the age of five or more without being subjected to examination. Comprises 142 persons.

This nominal list for 1991 was submitted to the municipal authorities of Cuevas del Almanzora (Almería). In order to allow for inclusion, up to the end of the year, of some other persons whose examination may be of interest for given reasons, the list is not considered closed.

The first of these campaigns has already been conducted and includes a total of 60 persons distributed into the following priority groups:

	No. of Persons
Group 1-A	13
Group 1-C	1
Group 2-A	1
Group 2-C	8
Group 3-A	30
Companions	7

The results of these analyses, now being obtained, will be included in subsequent reports.

1.2 DOSIMETRY FOR 1990 (PARTIAL)

Of the total of 149 persons monitored in 1990, urinary Am-241 excretion analysis was completed during this second [sic] half on 87. Analysis was completed earlier on 23. The results corresponding to the remaining 39 persons examined will be presented in the report for the second half of 1991, since, while the analyses are completed, their measurement is still pending.

The results of the Am-241 determinations in the urine of the

87 persons indicated are:

- The 87 persons surveyed gave Am-241 values below the AMD of the analytical method (0.7 mBq / 24 hour urine).

Consequently, and as an annual summary of the results of the measurements of the PU-239+PU-240 taken in the 149 persons who were monitored during 1990, and from the Am-241 results in 110 of them, it can be stated that positive plutonium values have been determined in the urine of six of these persons, and positive values of Am-241 have been determined in none of the 110 examined up to the present time.

Obviously the mechanisms activating the radiological monitoring of persons provide for the subsequent or successive examination of those who have given positive plutonium or americium results the first time.

The percentage of persons with a positive result, 6 of 149 (4%) for Pu and none of the 110 measured thus far in Am (0%), does not exceed the order of appearances greater than the LID calculated for the period 1967-1985 of 7.7% (86 cases out of 1155). See "Summarized Report of Radiological Monitoring conducted in the Palomares (Almería) Zone. JEN/PRYMA/M1/A--/7/1985, June 1985"). The distribution by ranges during this period, and obviously the distribution of the doses as well, correspond to a normal logarithmic function.

The most useful parameter for evaluating the impact to which the population in Palomares is being subjected is the collective dose (the "de facto" situation and subgroups which cannot be correlated with the present risk). However, those parameters which are obtainable are the median and the mean.

The median, which represents the most frequent effective dose equivalent completed in 50 years to the mean individual of the critical group, is less than 5 mSv. Thus, the results specified in this report, in addition to having been predictable, do not modify earlier obtained or reflected conclusions.

1.2.1 Medical Monitoring

In the first phase of the Radiological Monitoring Campaign in the Palomares Zone for 1991 (see Doc. M5A01/*******), carried out during the period between 6/17/91 and 6/24/91, medical examinations were administered to 20 persons.

In these medical examinations, conducted in accordance with the directions contained in Safety Guide No. 7.4 "Bases for Medical Monitoring of Workers Exposed to Ionizing Radiation", the recommendations of international organizations and the provisions of the Medical Service Organization Manual (see Doc. SGT/SL/SM/029/91), no pathology was detected which might be attributable to the incorporation of transuranic elements coming from residual contamination of the zone.

We list below the significant findings:

Absence of alterations	1
Mild alterations	12
Presence of pathologies	7

1. INFECTIOUS AND PARASITIC DISEASES (001-139)*
2. TUMORS (140-239)
3. DISEASES OF THE ENDOCRINE GLANDS, NUTRITION AND METABOLISM, AND IMMUNITY DISORDERS (240-279)

Moderate obesity	2
Severe obesity	2
Hyperglycemia	4
Hypercholesterolemia	4
Mixed hyperlipoproteinemia	1
Type II diabetes mellitus	1

4. DISEASES OF THE BLOOD AND HEMATOPOIETIC ORGANS (280-289)

Microcritical anemia	1
Eosinophilia	1
Leukocytosis with neutrophilia	1

---

* ICD Code - 9th Revision.

5. MENTAL DISORDERS (290-319)

Pathological anxiety	1
Insomnia	3
Excessive use of alcohol	1

6. DISEASES OF THE NERVOUS SYSTEM AND SENSORY ORGANS (320-389)

Migraine	1
Presbycia	4
Myopia	1
Acute unilateral loss of vision acuity	1
Acute bilateral loss of vision acuity	1
Hypoacusis	10
Impacted cerumen	1
Tinnitus	1

7. DISEASES OF THE CIRCULATORY SYSTEM (390-459)

Varicose veins of lower limbs	3
Arterial hypertension	1
Sinus bradycardia	1
Polytopical occasional extrasystole	1
Supraventricular occasional extrasystole	1
Incomplete blockage, right branch	3

8. DISEASES OF THE RESPIRATORY SYSTEM (460-519)

Allergic rhinitis	1
Chronic bronchitis	1
Acute rhinopharyngitis & repetition	2
Acute pharyngitis	1
Chronic pharyngitis	1

9. DISEASES OF THE DIGESTIVE SYSTEM (520-579)

Missing teeth	12
Gastric dyspepsia	3
Gastralgia	1
Constipation	1

10. DISEASES OF THE GENITOURINARY SYSTEM (580-629)

Dysmenorrhea	3
Premenstrual stress syndrome	2
Microhematuria	3
Microscopic pyuria	3
Menopause	1

11. PREGNANCY, CHILDBIRTH AND POST PARTUM COMPLICATIONS (630-676)

12. DISEASES OF THE SKIN AND SUBCUTANEOUS CELLULAR TISSUE (680-709)

Juvenile acne	1
Facial hypertrichosis	1
Anal pruritus	1
Abdominal forunculosis	1
Alopecia	1

13. DISEASES OF THE OSTEOMUSCULAR SYSTEM AND CONNECTIVE TISSUE (717-739)

Arthralgia of the knees	2
Arthralgia of the hands	1
Scoliosis	1
Cervicalgia	2
Cervicoarthrosis	1
Hallux valgus	1
Lumbosciatica	1

14. POORLY DEFINED SIGNS, SYMPTOMS AND DISEASED CONDITIONS (780-799)

ECG. AI hypertrophy	2
ECG. VI hypertrophy	1
Spirometry. Forced CV	1
Asthenia	3
Anorexia	2
Weight loss	1

Syncope	1
Palpitations	1
Malleolar edema	3
Hepatomegaly	1
Submaxillary adenopathies	1
Disphonia of repetition	1
Hyperbilirubinemia	1
Glucosuria	1
Ketonuria	1

15. TRAUMATISM AND POISONING (800-999)

The findings described correspond to the pathology which we find on a daily basis in periodic preventive examinations of workers, both those who are, and are not exposed to ionizing radiation, and in our judgment there is no indication of any unhealthy condition specifically induced by radioactive agents.

2. MONITORING OF THE ENVIRONMENT

2.1 GROUND

The activities specified below have been conducted wich relation to following ground contamination during this six-month period:

2.1.1 Sampling

a) Samples were taken from the surface soil layer (first 5 centimeters) at 28 equidistant (15m) points located over the length of parcel 2-0, with the purpose of determining surface concentrations of Pu-239+PU-240 and Am-241 following the remodeling operations which the zone has undergone.

b) Fifty-six surface samples were taken at 9 equidistant points located over the length of the diagonals of parcels 2-1, 2-2, 3-1, 5-1, 5-2 and 5-3B. These parcels are square with 50x50m sides.

2.1.2 Analysis

2.1.2.1 Determination of plutonium

During this first half of 1990, PU-239+PU-240 analyses were made of 67 surface soil samples. Forty-two of these

correspond to samples taken at seven points located on the outer perimeter of what was identified as the "zero line" of initial contamination, at an approximate distance of 500m from it. At each point a central sample and four samples at a distance of 150 meters in the four cardinal point directions were taken. The remaining analyses correspond to 25 samples taken at the outer perimeter of the so-called "zero line", at a distance of 1000m.

The sampling points are illustrated on Figure 1, which shows the original levels of contamination where the curve encircling the area is the so-called initial zero line.

The 42 analyses mentioned at first correspond to 21 samples mentioned in the first place correspond to 21 twice-analyzed samples taken from the points identified by the numbers 11, 12, 18, 22, 23, 26 and 28.

The values obtained are presented in Table No. 1. These data are a continuation of those already presented in the report "CIEMAT/PRYMA/UGIA/M5A01/03/90".

The data corresponding to the 25 perimeter samples are assembled on Table 2.

These data reveal a particle movement toward the exterior of the zero line or contamination line limit, following the 1966 accident. Obviously, resuspension is one of the processes contributing to redistribution of the initial contamination.

2.2 AIR

The following activities were carried out during the first half of 1991:

2.2.1 Sampling

Continuous weekly sampling has followed the method established in the report: M5A01/PI002/91, "RADIOLOGICAL MONITORING IN THE PALOMARES ZONE. PROGRAM FOR 1991" sent to the CSN, at the three stations which remain in operation. These three stations correspond to references 2-1 and 2-2 and P (urban zone).

Seventy-two samples were collected, with an air volume of approximately 10 000 m^3 per sample.

2.2.2 Plutonium concentration

Radiochemical analyses to determine the Pu-239+Pu-240 concentration in the air samples taken weekly have been accomplished on a monthly basis.

Building P (urban zone)

The samples analyzed are distributed by collection date, in the following manner:

30 samples from 1990 (March-November)

The Pu-239+Pu-240 concentration values corresponding to this period are shown in Table 3.

From the set of readings obtained, it is inferred that:

- The mean value of the plutonium concentration in the urban area of Palomares during 1990 was 7.7 $\mu Bq/m^3$.
- The range of plutonium concentrations in this urban zone during this six-month period has fluctuated between < .2 and 54.2 $\mu Bq/m^3$.
- Both the mean and maximum concentration of plutonium during this period of 1990 remained very far below the derived concentration in air (5 900 $\mu Bq/m^3$) for Class Y plutonium compounds, as can be inferred from the limit value established by Spanish law (4) for annual incorporation by inhalation.

Building 2-1

There were 52 samples corresponding to 1989, and 17 samples corresponding to the period January - April 1990 analyzed during this semester.

The data corresponding to Station 2-1 during 1989 are shown on Table 4.

It is inferred from these values that:

- The mean concentration of plutonium at Station 2-1 during 1989 was 20.5 $\mu Bq/m^3$.
- The weekly concentrations of plutonium at this station during 1989 were in the range of between 1.1 and 111.7 $\mu Bq/m^3$.
- Both the mean and maximum value of the weekly plutonium concentrations during 1989 were very much lower than the derived concentration in air, 5 900 $\mu Bq/m^3$, for Class Y plutonium com-

pounds, as can be inferred from the limit value of annual incorporation by inhalation established by Spanish law (3).

2.2.3 Americium determination

The following air samples were analyzed radiochemically to determine their concentration of Am-241

- Station 2-1: 42 samples from 1990 (January - September)

The chemical treatments of the radioanalytical process were applied separately to each weekly sample, however the electrodeposits and subsequent measurement by alpha spectrometry were made on the corresponding samples compounded at eight weeks.

The results of the 42 samples from 1989 corresponding to Station 2-1, which were analyzed and measured during this second [sic] half of the year are shown on Table 5.

From these results it is inferred that:

- The mean concentration of Am-241 in the air of this zone, during this period of 1989 was 6.9 $\mu Bq/m^3$.

- The range of Am-241 concentrations during 1989 fluctuated between < 0.2 and 25.7 $\mu Bq/m^3$.

- Both the mean and maximum value of the Am-241 air concentration during 1989 remained very much below the limit of derived concentration in air for Am-241 compounds, which is 2.360 $\mu Bq/m^3$ under Spanish legislation (3).

2.3 VEGETATION

The following activities have been carried out in this area:

2.3.1 Sampling

In accordance with the specifications established in report M5A01/PI002/91, "RADIOLOGICAL MONITORING IN THE PALOMARES ZONE. PROGRAM FOR 1991", we list below, the vegetation and cultivated product samples collected during this first half of 1991.

• 5 samples of watermelons and 5 samples of watermelon plants coming from one parcel of Zone 2, two parcels of Zone 3 and two parcels of Zone 5. These were collected in June.

• 7 samples of barley, representative of this year's cereal crop, coming from Zones 2, 3 and 5-3B. These were collected during May.

• 2 samples of muskmelons and two of their plant coming from one parcel located in Zone 2 and another in Zone 3.. They were collected in June.

2.3.2 Plutonium determination

During this period plutonium analyses were conducted on five 1989 samples and 42 from 1990. The final measurement was made by alpha spectrometry in 56 samples. Some are 1990 samples which had already been analyzed and were pending measurement.

The results corresponding to the 5 samples from 1989 measured during this first half are shown on Table 6.

The 1990 samples analyzed this semester were broken down as follows by species and components:

• 4 tomato samples, 4 of washed tomatoes and 4 of their plants.

• 1 olive sample and one of olive leaves.

• 2 watermelon samples and one of its rind.

• 1 sample of wheat grain, 1 of its spike and 1 of its straw.

• 6 barley grain samples, 6 of the straw and 6 of its spike.

• 2 pimiento samples and 1 of the plant.

• 1 eggplant sample.

The results of the analyses corresponding to the samples measured in this first six-month period of 1990 are given on Tables 7 - 11 by the zone from which taken. These tables include data already presented in the earlier report: CIEMAT/PRYMA/M5A01/1/91 "RADIOLOGICAL MONITORING IN THE PALOMARES ZONE (Report for the second half of 1990); the purpose being to provide an overview of the entire year.

The most important considerations which can be inferred from these results are:

- In general, the tomato fruits present no Pu-239+Pu-240 contamination, especially after being washed. Out od a total of twelve 1990 samples analyzed, five samples of unwashed tomatoes and

one of washed tomatoes gave positive values.

Such values of 0.01, 0.04, 0.13, 0.17, 0.10 Bq/kg in the unwashed tomatoes and 0.02 Bq/kg in the washed tomatoes are negligible from the point of view of the risk involved, since the official limit for annual incorporation by ingestion of Class Y plutonium compounds is 200 000 Bq.

- In relation to the edible portion of the water melons and muskmelons, only one water melon sample and one muskmelon sample from Zone 2-0 presented a plutonium concentration of 0.5 Bq/Kg, a level which is so small that no risk whatever is involved.

- A mild concentration of plutonium was found in the unwashed water melon samples from Zone 2. These readings might be due to external contamination of the samples.

- In the cereal samples analyzed it is observed that the mean level of concentration in the barley grain samples showing positive results is 0.82 Bq/g and 137 Bq/g in the straw.

The use of the barley and straw, then, for animal feed, its ingestion transfer factor (10^{-4} to 10^{-5}) and the factors of transfer to the animal food products combine to make the risk involved negligible, as a practical matter.

The concentration level in the wheat grain sample is 0.27 Bq/g. The risk of utilization of the wheat for direct human consumption can be considered very small, if we take into account that the annual official incorporation limit for ingestion is 200 000 Bq for Class Y plutonium compounds.

3. PARTICIPANTS

The following CIEMAT personnel have participated in the activities which led to the acquisition of the data, specifications and conclusions set forth in this report:

Senior Technicians: José Gutierrez, C. Emma Iranzo, Angel Bellido, Santiago Castaño, María Asunción Espinosa and Emilio Iranzo.

Technicians: Camila Blanco, Ludivina Borrego, María del Carmen Guzman, Francisco Moreno, Mariano Moya and Carmen Barros,

responsible for the transcription and preparation of this manuscript.

5. REFERENCES

(1) Summarized Report on Radiological monitoring conducted in the Palomares (Almeria) Zone. JEN/PRYMA/M1/A--/7/1985, June 1985.

(2) Vigilancia Radiólogica en la zona de Palomares. Programa para el año 1991. Radiological Monitoring in the Palomares Zone. Program for 1991. CIEMAT/PRYMA/M5A01/PI002/91.

(3) Reglamento sobre Protección Sanitaria contra Radiaciones ionizantes. B. O. E. Nos. 13, 15 of January 1988.

(4) Vigilancia Radiólogica en la zona de Palomares. Segunda semestre 1990. Radiological Monitoring in the Palomares Zone. Second half of 1990. CIEMAT/PRYMA/M5A01/1/91.

TABLE 1. CONCENTRATION OF PU-239+240 RADIOACTIVITY IN SURFACE SOIL SAMPLES. EXTERIOR LINE (Bq/gr)

11	Center	
11′	Center	≤ LID
11	East	≤ LID
11′	East	≤ LID
12	East	≤ LID
12′	East	≤ LID
12	South	≤ LID
12′	South	0.03 ± 0.007
18	Center	≤ LID
18′	Center	≤ LID
22	East	≤ LID
22′	East	0.016 ± 0.004
23	North	
23′	North	≤ LID
26	North	
26′	North	≤ LID
26	South	
26′	South	≤ LID
26	East	≤ LID
26′	East	0.03 ± 0.008
26	West	≤ LID
26′	West	
26	Center	≤ LID
26′	Center	≤ LID

TABLE 1 (Cont.)

28	North	.....	$\leq$ LID
28′	North	.....	$\leq$ LID
28	South	.....	0.003 $\pm$ 0.0008
28′	South	.....	0.09 $\pm$ 0.0015
28	East	.....	$\leq$ LID
28′	East	.....	0.005 $\pm$ 0.014
28	West	.....	$\leq$ LID
28′	West	.....	
28	Center	.....	0.005 $\pm$ 0.0012
28′	Center	.....	$\leq$ LID

TABLE 2. CONCENTRATION OF PU-239+240 RADIOACTIVITY IN SURFACE SOIL SAMPLES. EXTERIOR LINE 0 (Bq/gr)

(1)	
Punto 1	$\leq$ LID
Punto 2	$\leq$ LID
Punto 3	$\leq$ LID
Punto 4	$\leq$ LID
Punto 5	0.01 $\pm$ 0.002
Punto 6	0.03 $\pm$ 0.006
Punto 7	$\leq$ LID
Punto 8	$\leq$ LID
Punto 9	$\leq$ LID
Punto 10	
Punto 11	$\leq$ LID
Punto 12	$\leq$ LID
Punto 13	$\leq$ LID
Punto 15	$\leq$ LID
Punto 16	$\leq$ LID
Punto 18	$\leq$ LID
Punto 19	$\leq$ LID
Punto 20	$\leq$ LID
Punto 21	0.17 $\pm$ 0.028
Punto 22	$\leq$ LID
Punto 23	$\leq$ LID
Punto 24	0.003 $\pm$ 0.0010
Punto 25	$\leq$ LID
Punto 26	2.6 $\pm$ 0.63
Punto 27	23.6 $\pm$ 3.90

KEY: 1) Point.

TABLE 3. CONCENTRATION OF PU-239+240 RADIOACTIVITY IN PALOMARES AIR SAMPLES

CONCENTRATION OF PLUTONIUM 239 + 240 ($\mu Bq/m^3$)

PERIOD	BUILDING P (Urban zone)	BUILDING 2-1
①		
30-12-89 al 03-02-89		0,8 ± 0,20
03-02-90 al 03-03-90		1,1 ± 0,25
03-03-90 al 31-03-90		0,5 ± 0,16
24-03-90 al 31-03-90	0,7 ± 0,17	
31-03-90 al 04-05-90	4,2 ± 0,76	
31-03-90 al 27-04-90		2,3 ± 0,48
04-05-90 al 01-06-90	< LID	
27-04-90 al 01-06-90	4,3 ± 0,77	
01-06-90 al 29-06-90	1,1 ± 0,19	
29-06-90 al 03-08-90	2,9 ± 0,48	
03-08-90 al 31-08-90	54,2 ± 9,7	
31-08-90 al 28-09-90	0,5 ± 0,10	
28-09-90 al 02-11-90	1,6 ± 0,28	

KEY: 1) to.

TABLE 4. CONCENTRATION OF Pu-239+Pu-240 RADIOACTIVITY IN PALOMARES AIR SAMPLES

CONCENTRATION OF PLUTONIUM 239 + 240 ($\mu Bq/m^3$)

PERIOD	BUILDING 2-1
31-12-88 al 28-01-89	23,1 ± 3,68
28-01-89 al 25-02-89	3,5 ± 0,63
25-02-89 al 01-04-88	27,1 ± 4,33
01-04-88 al 29-04-89	111,7 ± 16,8
29-04-89 al 03-06-89	2,8 ± 0,56
03-06-89 al 01-07-89	1,6 ± 0,38
01-07-89 al 29-07-89	66,0 ± 9,9
29-07-89 al 02-09-89	4,0 ± 0,75
02-09-89 al 30-09-89	1,5 ± 0,39
30-09-89 al 28-10-89	1,5 ± 0,29
28-10-89 al 02-12-89	2,3 ± 0,39
02-12-89 al 30-12-89	1,1 ± 0,21

Key: 1) to.

TABLE 5. CONCENTRATION OF AMERICIUM-241 RADIOACTIVITY IN PALOMARES AIR SAMPLES

CONCENTRATION OF AMERICIUM-241 ($\mu Bq/m^3$)

PERIOD	BUILDING 2-1
①	
31-12-88 al 25-02-89	< LID
25-02-89 al 29-04-89	25,7 ± 4,36
29-04-89 al 01-07-89	< LID
01-07-89 al 02-09-89	8,2 ± 1,39
02-09-89 al 28-10-89	< LID

KEY: 1) to.

TABLE 6. PLUTONIUM-239 CONTENT IN THE VEGETATION OF AREA 2 DURING 1989

SAMPLING DATE	FARM	VEGETABLE		RADIOACTIVITY CONCENTRATION
		Species	Part	Bq/kg.
28-06-89	2	Water melon	Plant	1.7 ± 0.29
"	5	Water melon	Plant	4.6 ± 0.74
"	5	Water melon	Fruit (rest)	< LID
"	2-0	Water melon	Fruit (rest)	< LID
"		Water melon	Fruit (rind)	< LID

TABLE 7. PLUTONIUM-239 CONTENT IN THE VEGETATION OF AREA 2 DURING 1990

SAMPLING DATE	FARM	VEGETABLE		RADIOACTIVITY CONCENTRATION
		Species	Part	Bq/kg.
17-01-90	2-2 M.S.N	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	0.48 ± 0.08
"	Parcela cemen.	Tomato	Unwashed	0.10 ± 0.02
"	"		Washed	< LID
"	"		Plant	0.09 ± 0.014
18-11-90	2-2 M.P.P	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	1.2 ± 0.23
15-01-90	2-2	Olive	Fruit	< LID
"	"		Leaves	0.63 ± 0.10
03-07-90	2-2	Water m.	Fruit (rest)	< LID
"	"		Fruit (rind)	< LID
"	"		Plant	
03-07-90	2-1	Water m.	Fruit (rest)	
"	"		Fruit (rind)	< LID
"	"		Plant	4.7 ± 0.73
15-05-90	M.N.A	Barley	Straw	1.2 ± 0.20
"	"		Grain	0.13 ± 0.029
"	"		Spike	1.2 ± 0.23
18-11-90	M.S.S	Olive	Fruit	0.07 ± 0.014
"	"		Leaves	
"	2-2 M.P.P	Pimiento	Fruit	< LID
"	"		Washed fruit	< LID
"	"		Plant	
18-11-90	2-1 J.Z.T	Eggplant	Fruit	
"	"		Washed fruit	< LID
"	"		Plant	

TABLE 8. PLUTONIUM-239 CONTENT IN THE VEGETATION OF AREA 2-0 DURING 1990

SAMPLING DATE	FARM	VEGETABLE		RADIOACTIVITY CONCENTRATION Bq/kg.
		Species	Part	
03-07-90	2-0	Water m.	Fruit (rest)	0.49 ± 0.07(
"	"		Rind	
"	"		Plant	0.50 ± 0.08(
03-07-90	2-0	Water m.	Fruit (rest)	11.8 ± 1.80
"	"		Rind	
"	"		Plant	0.54 ± 0.0(
03-07-90	2-0	Muskm.	Fruit (rest)	
"	"		Rind	
"	"		Plant	

TABLE 9. PLUTONIUM-239 CONTENT IN THE VEGETATION OF AREA 3 DURING 1990

SAMPLING DATE	FARM	VEGETABLE		RADIOACTIVITY CONCENTRATION Bq/kg.
		Species	Part	
17-01-90	J.A.L	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	< LID
"	F.F.G	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	< LID
"	D.S.C	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	0.28 ± 0.01
18-11-90	J.A.L	Tomato	Unwashed	0.17 ± 0.03
"	"		Washed	< LID
"	"		Plant	< LID
18-11-90	J.F.G	Tomato	Unwashed	0.13 ± 0.020
"	"		Washed	0.02 ± 0.004
"	"		Plant	< LID
15-05-90	D.S.M	Barley	Straw	219 ± 33
"	"		Grain	0.13 ± 0.026
"	"		Spike	4.5 ± 0.76
15-05-90	A.A.T	Barley	Straw	326 ± 49
"	"		Grain	2.9 ± 0.48
"	"		Spike	193 ± 29
15-05-90	A.A.A	Barley	Straw	
"	"		Grain	
"	"		Spike	12.2 ± 1.90
15-05-90	J.C.N	Barley	Straw	1.0 ± 0.19
"	"		Grain	0.12 ± 0.025
"	"		Spike	4.1 ± 0.69
18-11-90	D.S.C	Pimiento	Fruit	< LID
"	"		Washed fruit	< LID
"	"		Plant	
03-07-90	3-1 J.F	Water m.	Fruit (rest)	< LID
"	"		Fruit (rind)	< LID
"	"		Plant	0.95 ± 0.160

TABLE 10. PLUTONIUM-239 CONTENT IN THE VEGETATION OF AREA 5 DURING 1990

SAMPLING DATE	FARM	VEGETABLE		RADIOACTIVITY CONCENTRATION Bq/kg.
		Species	Part	
17-01-90	B.A.S.	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	< LID
18-11-90	B.A.S.	Tomato	Unwashed	0.01 ± 0.002
"	"		Washed	< LID
"	"		Plant	< LID
17-01-90	J.F.G.	Tomato	Unwashed	0.04 ± 0.008
"	"		Washed	< LID
"	"		Plant	
15-05.90	5-1	Wheat	Straw	0.27 ± 0.059
"	"		Grain	0.27 ± 0.050
"	"		Spike	2.5 ± 0.42
03-07-90	5-1	Water m.	Fruit (rest)	
"	"		Fruit (rind)	< LID
"	"		Plant	1.6 ± 0.26

TABLE 11. PLUTONIUM-239 CONTENTS IN THE VEGETATION OF PARCEL 5-3B in 1990

SAMPLING DATE	FARM	VEGETABLE		RADIOACTIVITY CONCENTRATION Bq/kg.
		Species	Part	
17-01-90	5-3B	Tomato	Unwashed	< LID
"	"		Washed	< LID
"	"		Plant	1.8 ± 0.37
15-05-90	5-3B	Barley	Grain	< LID
"	"		Straw	< LID
"	"		Spike	0.60 ± 0.100